

Curricular Content Level of Complexity Is a Factor of Depression and Learning in Medical Students

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Abstract

The aim of this paper was to analyze the impact of Human Physiology curriculum on depression and academic performance of medical students. Beck instrument was applied before exams' period to all students who voluntarily participated and the grades gotten in each of the three Human Physiology exams were correlated with all first year's averages. Descriptive and inferential statistics were carried out. We found a significant relationship between the complexity of Human Physiology curriculum and the number of cases of depression, resulting in low academic average; high correlations were among Human Physiology contents and those of Biochemistry and Anatomy. It is important to implement support programs to follow students' emotional welfare as well as to go over the subject's content.

Keywords

Depression, Medical Student, Human Physiology Curriculum, Academic Average

1. Introduction

1.1. Depression and Academic Performance

The academic field represents a set of stressing situations for students as they may experience a lack of control over the new environment and consequently turn into academic failure [1]. Several investigations have shown the existence of noticing indexes of stress in university populations, specially, during the first courses of the medical career and the time before exams [2]-[5].

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Medical career, in particular, due to its curricular load, demands great commitment and discipline of study from students; some of them cannot cope with all the work or do not have a solid academic background, which consequently alters their mental and physical state. It has been reported the impact in mental health, stress, anxiety and depression experienced by medical students throughout their school year, which causes problems such as low academic performance [6]-[9].

Some authors have also reported that during the second year of medical career, the levels of anxiety and stress are much more elevated than during the first year; maybe because this second year is still within the adaptation period at the school for many students [10]-[14]. Others have determined that medical students' stress increases along with their studies in the clinical area, therefore representing a higher risk of academic failure [15].

The most significant causes of stress among medical students are the study material excess, lack of organizing time, pressure from professors, exams, fatigue as well as personal and familiar issues. Moreover, it has to be considered that academic stress affects three main areas: behavior, cognition and learning. In the behavior area, it has been studied how lifestyle changes during exams; tobacco, caffeine and alcohol consumption increase to keep awake.

1.2. Medical Curriculum

The 2010 Medical Curriculum of the Faculty of Medicine at UNAM is dedicated to teach according to new trends in medical education to fit the changing situation of the health system and the society's needs and expectations. During the first two years, the teaching of biomedical areas is emphasized: human physiology's objective in the formation of the future surgeon is to provide knowledge of the human organism's functions, to make students acquire the necessary scientific methodology for its study and to develop attitudes towards health maintenance and the treatment of diseases; in addition to this, inclusive macrostructure of the body, the function of the organs, the biochemistry and the pharmacological mechanisms, and consequently, the regular functioning as well as possible therapeutics [16] [17].

UNAM's medical students show a higher index of physiology failing in regards to other subjects. Given the importance in the formation of the future surgeon, the aim of this work is to learn whether the complexity of Human Physiology curriculum causes depression before exams affecting their grades.

2. Material and Methods

2.1. Ethical Aspects

The Ethics and Research Committees of the Faculty of Medicine at UNAM approved the research protocol. The participants, who volunteered, signed an acceptance letter. The results were used carefully guarding their confidentiality. The instruments were applied to second grade students taking Human Physiology and only those who completed their answers were considered.

2.2. Type of Curriculum and Course Setup

The UNAM's 2010 Medical Curriculum is a mixed program as areas and subjects are interacting to conform the curriculum to an orientation towards the development of competences. During the first two years, the teaching of the biomedical area is emphasized. First year: Anatomy, Biochemistry and Molecular Biology, Cellular Biology and Medical Histology as well as Human Embryology. Second year: Human Physiology is given with four hours of theory a week and four of practice during 32 weeks, with a total of 23 credits. The assessment is carried out through exams (50%) and the professor's criterion (50%).

The topics being dealt with are divided into thematic units. The first exam assesses cellular physiology, neurophysiology and the autonomic nervous system; the second, cardiovascular, respiratory and renal physiology; and the third one, endocrine system and the digestive apparatus.

2.3. Questionnaire

Beck Depression Inventory (BDI). This is one of the most used instruments for the assessment of depressive symptoms in adolescents and adults [18] [19]. It comprises 21 self-applicable questions; every question includes a series of four asseverations from which one has to be chosen in regards to the way the patient has felt

throughout the week. The total score varies from 0 to 63. A score higher or equal to 12 points was considered as a signaling cut to identify the cases with probable depression [20]-[22].

This instrument was applied to second grade medical students during the school year 2013-2014, a week before exams. The percentage of right answers in the three Human Physiology exams from August 2013 to May 2014 was considered as well as the final average of those from the first year August 2012 to May 2013 of only Anatomy, Biochemistry and Molecular Biology, Cellular Biology and Medical History as well as Human Embryology's. It is important to highlight that the exams were applied at the same time to all populations and each contained 50 to 70 items chosen by a group of experts from an items bank (Cronbach \geq 0.87 Y 0.92; level of difficulty = 30 and 70; positive discrimination = 70 and 90).

In order to learn the levels of complexity of the themes covered in each of the three Human Physiology exams, we carried out correlations with grades obtained in the first year's biomedical area (Anatomy, Biochemistry and Molecular Biology, Cellular Biology and Medical Histology as well as Human Embryology).

2.4. Statistical Analysis

The data were analyzed with the SPSS version 20. The statistical analysis was descriptive and inferential; they were conducted under the assumption of a type I error rate of 0.05.

3. Results

The number of students that had answered the Beck questionnaire before each exam varied because, the day of its application, only those who had attended, out of 1035 students in second grade, answered it. In the first exam, 20% took it; in the second 27%; and, in the third, 46% of the total generation.

Table 1 shows the average of right answers in each exam, as well as the percentage of cases of depression. It was noted that during the second exam is where the highest percentage of depression cases were found (32%) and a lesser number of right answers in the exam (means 50) compared with that of the other two exams showing that it was during the cardiovascular course when students got the least checks.

The Kolmogorov-Smirnov statistical test showed no normality in the behavior of the percentages of assertiveness in the exams. We applied the Kruskal-Wallis test, which reported significant differences among them $p \leq 0.0001$.

Pearson correlations (**Table 2**) show that averages obtained in the second exam have the highest correlation with each one of the averages obtained in the curriculum first year biomedical area subjects.

Table 1. Results of score and depression during exams.

Exams	Media \pm SD	% Cases	N
First	65 \pm 2.8	23	207
Second	50 \pm 3.8	32	279
Third	60 \pm 3.9	13	280
Final	58 \pm 3.5		

Table 2. Average correlation of the three human physiology exams and that of first year biomedical area subjects.

First year subjects	Human physiology exams		
	First	Second	Third
Anatomy	0.50	0.58	0.54
Cellular biology and medical histology	0.47	0.53	0.50
Biochemistry and molecular biology	0.49	0.55	0.56
Human embryology	0.45	0.60	0.44

In order to conduct a deeper correlation, we considered the averages per student in each Anatomy, Biochemistry, Histology and Human Embryology exam, which were correlated with the average of the second Human Physiology exam (**Table 3**). The results showed that the cardiovascular theme covered in the second Human Physiology exam has a higher correlation with that of Anatomy discussing Generalities of the spinal column, head and neck; with those of Cellular Biology and Medical Histology with themes on cells and tissues; with those seen in Biochemistry and Molecular Biology, carbohydrates metabolism, transport, glucogenesis, Krebs cycle and antioxidants; and lastly, with Human Embryology, where they learn about gastrulation, placenta and nexus.

4. Discussion

As it can be noted in the results from **Table 1**, we found that there is a relationship between the number of right answers and the level of depression that students show during the second exam, which coincides with literature in terms of a poor academic performance associated with levels of depression in the medical training [2]-[4] [6] [11]. Moreover, the results show that the cardiovascular topic addressed in the second set is the one that caused more depression to students and in which less percentage of right answers was obtained; the Kruskal-Wallis test reported significant differences among them $p \leq 0.0001$. It is important to highlight that the cardiovascular mechanisms are comprehensive components in the understanding of the physiopathological changes of diseases and in the integration of the basic and clinical sciences in a meaningful way [23]. In this research work, we showed the significant interaction of biomedical area's learning to integrate Human Physiology knowledge (Pearson correlations 0.44 to 0.60); some authors have reported the difficulty that students face to assimilate the physiological processes in these systems [24].

The latter shows the urgency to carry out a diagnosis of the complexity of the program's contents, as it shows that the objective to provide knowledge of the functions of the organism before the students' entry to clinical venues is not being accomplished and that this may lead to bad medical diagnosis that they give during their training in the clinical area. The medical student must handle knowledge, concepts and basic principles (core curricula) integrated from medical basic sciences [25], know when it is clinically important to focus in details, and use these data to back up the best medical decision for each individual patient. In addition to this, the General Medical Council "Tomorrow's Doctors", the Australian Medical Council, the Association of American Medical Colleges (AAMC), and the National Commission for Academic Accreditation & Assessment highlighted the importance of reducing the academic overload in the study curriculum [26]-[28].

With this study we show that the complexity of contents cause a high level of depression in students, which directly affects their academic performance. This is due mainly to the complexity of the cardiovascular course and its interrelation with the contents of first subjects taught the year before as shown by the Pearson correlations 0.49 to 0.50. We consider that previous knowledge of the biomedical area that students were supposed to have built as significant was not achieved thus becoming a depression factor that results in poor academic performance. It is probable that the implementation of a remedial course between the first and second years of medical school considering only the contents of those subjects that have a higher correlation with the understanding of Human Physiology may improve students' academic performance.

Table 3. Correlations of human physiology second exam averages in each of the biomedical area subjects.

		Anatomy		
First	Second	Third	Fourth	
0.49	0.36	0.36	0.41	
Histology				
0.49	0.29	0.34	0.36	
Biochemistry				
0.49	0.49	0.41	0.41	
Embryology				
0.50	0.43	0.38	0.46	

5. Conclusions

Biomedical area professors must promote interdisciplinary teaching for the student to integrate knowledge in the Human Physiology subject.

Finally, educational institutions must direct their efforts towards the analysis of Human Physiology contents and only teach those nuclear contents for the prevention and effective handling of depression in students.

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